AD-A104 666 ARMY ENGINEER DISTRICT ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. BECKER LAKE DAM (NO NAME 250) (MO --ETC(U)
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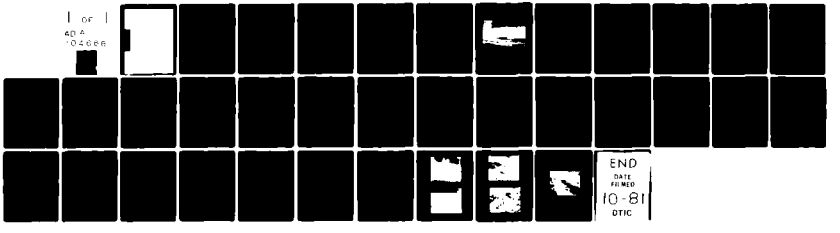

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A104 666	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Dam Inspection Report National Dam Safety Program Becker Lake Dam (MO 30435) Jefferson County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report.
	6. PERFORMING ORG. REPORT NUMBER
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9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE September 1978
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16. DISTRIBUTION STATEMENT *(of this Report)* Approved for release; distribution unlimited.	
17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*	
18. SUPPLEMENTARY NOTES	
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)* Dam Safety, Lake, Dam Inspection, Private Dams	
20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)* This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

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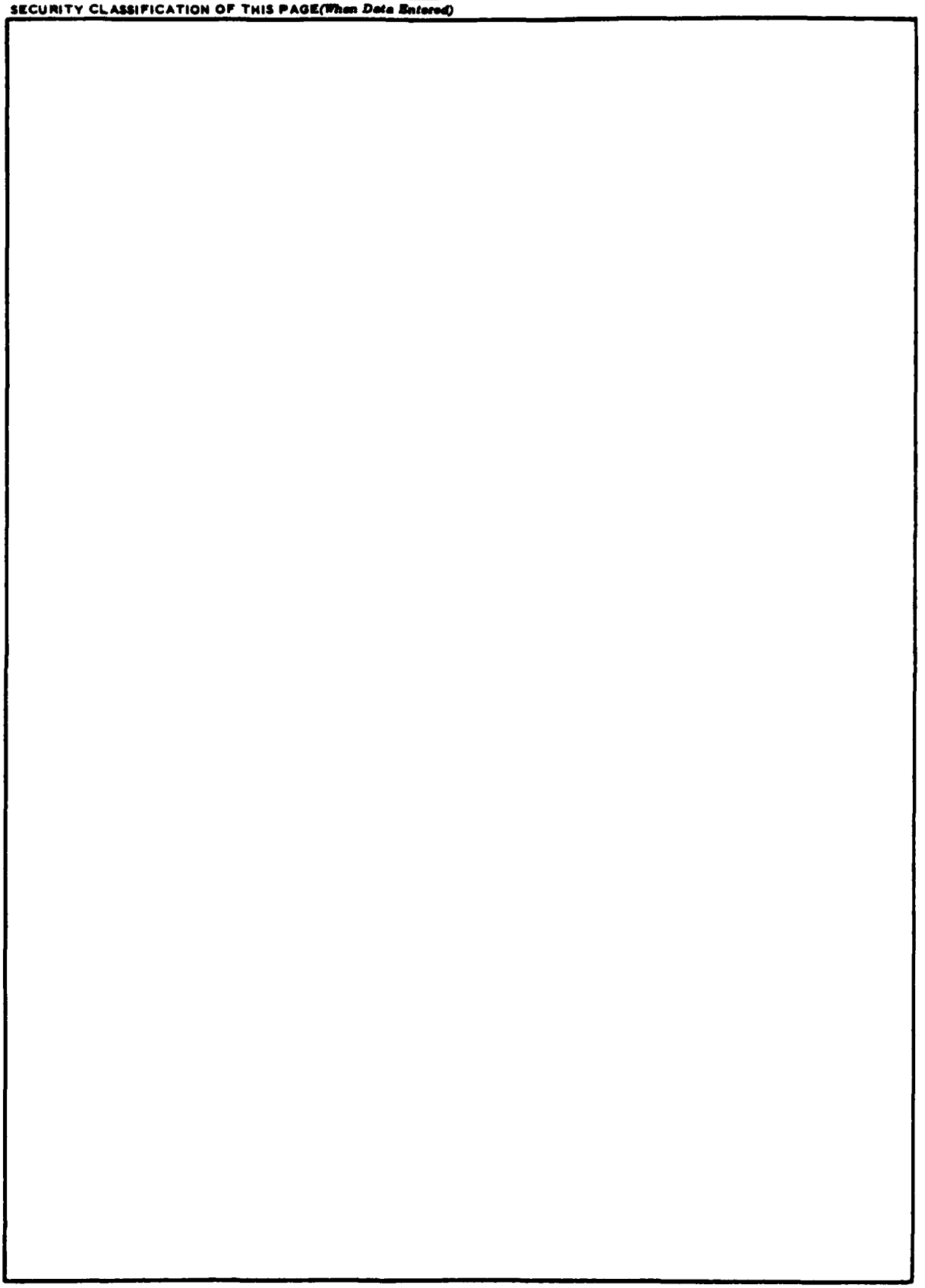

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Phase I Report
National Dam Safety Program

NAME: Becker (Previously identified as Mo No Name 250)
LOCATION: Jefferson County, Missouri
STREAM: Unnamed Tributary of Belew Creek
DATE OF INSPECTION: 7 September 1978

Becker Dam (Mo. 30435) was inspected using the "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed by the Chief of Engineers, U.S. Army, Washington D.C., with the help of Federal and state agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. The downstream damage zone is approximately 2 miles long. Three groups of farm buildings would be subjected to flooding with possible damage and/or destruction and possible loss of life. The dam is in the small size classification because it is less than 40 feet high and impounds less than 1000 acre-feet of water.

For its size and hazard category, this dam is required to pass from one-half the Probable Maximum Flood (PMF) to the PMF. Considering the small volume of water impounded, the large floodplain downstream, and the three groups of farm buildings downstream, one-half PMF is the appropriate spillway design flood. Since the spillway of this dam will pass only 25 percent of the PMF without overtopping the dam, and since overtopping of the dam could cause breaching due to erosion, it is classified as an unsafe non-emergency structure due to serious inadequacy of the spillway. Also, our evaluation indicates that the spillway will not pass the 100-year flood, that is a flood having a 1 percent chance of exceedence in any given year.

The inspection team observed brush and a few small trees growing on the dam. These root systems are a potential seepage hazard. One rodent hole was observed in the upstream slope and the potential exists for additional such holes to be located after the trees and brush have been removed. A suitable turf should be established after the trees and brush have been removed and rodent holes filled. Two seepage areas were noted on the downstream slope.

The earthen sections adjacent to the rock spillway do not appear sufficiently resistant to prevent embankment erosion at high flows for an indefinite time. Seepage and stability analyses are not on record as recommended in the guidelines which is considered a deficiency which should be rectified.

It is recommended that action be taken by the owner to correct the deficiencies listed herein in the near future. Corrective works should be in accordance with analyses and design performed by an engineer experienced in the design of dams. These conclusions were reached by the undersigned inspection team members.

Joseph L Schwenk
JOSEPH SCHWENK
Soils Engineer

Lynne E Puetz
LYNNE PUETZ
Hydraulic Engineer

SUBMITTED BY: Jack R Chaimi
Chief, Engineering Division — 22 Sept 78
Date

APPROVED BY: Leon E Mallard
Colonel, CE, District Engineer — 22 Sep 78
Date

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OVERVIEW OF BECKER DAM AND LAKE

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
BECKER DAM

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
BECKER DAM ID NO. 30435

Section 1 - Project Information

1.1 GENERAL.

a. Authority: The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the Becker Dam be made.

b. Purpose of Inspection: The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria: The inspection was accomplished using the "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed by the Chief of Engineers, U.S. Army, Washington D.C., with the help of several Federal and state agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

1.2 DESCRIPTION OF PROJECT.

a. Description of Dam and Appurtenances: The dam is an earth fill dam with a spillway cut into the rock formation in the left abutment. The lake is formed by two small creeks, the left one of which has a small dam immediately upstream of this lake (see paragraph 1.4 below). The drainage area of these lakes does not have any improvements except the owner's cabin. However, the owner indicated that he has plans to subdivide his property into 18-20 lots and sell them as home/cabin sites. Some grading work was being performed in the area at the time of the inspection.

b. Location: Section 20, Township 41 North, Range 4 East

c. Size Classification: Small

d. Hazard Classification: High

e. Ownership: Mr. Fred Becker
9217 Matthews Lane
St. Louis, Missouri 63127

f. Purpose of Dam: Recreation

g. Design and Construction History: The dam was constructed 13 years ago (1965+) for the present owner. The dam was constructed using borrow material from the lake area and adjacent shoreline areas placed in lifts and commpacted by tracking with a dozer. The dam foundation was reportedly stripped to bedrock for a 10-15 foot width prior to placing the embankment material.

h. Normal Operating Procedure: No operating records exist. Outflow passes over the uncontrolled spillway.

1.3 PERTINENT DATA.

a. Drainage Area: 174 acres

b. Discharge at Damsite: Not known

Maximum known flood at damsite - 1 foot depth over spillway reported

Spillway capacity at maximum pool elevation - 550 cfs

c. Elevation (feet above m.s.l. from assumed benchmark located at the small upstream dam):

Top of dam - 582.0

Flood control pool - 582.0

Recreation pool - 579.2

Streambed - 554+

Maximum tailwater - Not known

d. Reservoir:

Length of maximum pool - Approximately 900 feet

Length of recreation pool - Approximately 800 feet

e. Storage (Acre-feet):

Recreation pool - 80

Flood control pool - 100

Design surcharge - 0

Top of dam - 100

f. Reservoir Surface (Acres):

Top of dam - 10.6

Maximum pool - 10.6

Flood control pool - 10.6

Recreation pool - 9.1

Spillway crest - 9.1

g. Dam:

Type - Earth fill

Length - 500 feet

Height - 28± feet

Top width - 12 feet

Side Slopes - Varies, typically 1 vertical on 2.7 horizontal downstream; upstream side slope could not be determined. A typical section is shown on PLATE 4.

Zoning - Not known

Impervious Core - Unknown. Dam is apparently constructed of relatively impervious brown silty gravelly clay.

Cutoff - Reportedly a 10-15 foot wide clay cutoff to bedrock.

Grout curtain - None

h. Diversion and Regulating Tunnel: None

i. Spillway:

Type - Earth/rock channel (13-foot wide spillway)

Length of weir - Not applicable

Crest elevation - 579.2

Gates - None

j. Regulating Outlets: None

1.4 UPSTREAM DAM. The upstream dam was built about 1969+ essentially as described herein for the main dam. The owner is presently modifying this upstream dam to construct a road across it. His proposed modifications consist of installing a 30-inch reinforced concrete culvert pipe in the spillway, backfilling the spillway, raising the dam 2 to 3 feet, and filling a swale at the right abutment. This upstream dam is approximately 22 feet high. Since the safety of Becker Dam is directly related to the safety of this upstream dam, the upstream dam will be included in the dam inspection program and a separate report prepared.

Section 2 - Engineering Data

2.1 DESIGN. No design drawings or computations were available. The owner could not locate the construction drawings which were made at the time the dam was built.

2.2 CONSTRUCTION. The dam was reportedly constructed 13 years ago (1965±) for the present owner. Prior to constructing the dam, the owner received general assistance from a local soil conservation agent in Hillsboro, Missouri. The dam was reportedly constructed using borrow material from the lake area placed in lifts and compacted by tracking with a dozer. The dam foundation was reportedly stripped to bedrock for a 10- to 15-foot width prior to placing the embankment material.

2.3 OPERATION. No operating records exist. Outflow passes over the uncontrolled spillway.

2.4 EVALUATION.

a. Availability: The only available engineering data are the personal recollections of the owner, Mr. Fred Becker.

b. Adequacy: The field surveys and visual inspections presented herein are considered adequate to support the conclusions of this report.

c. Validity: Not applicable.

Section 3 - Visual Inspection

3.1 FINDINGS.

a. General: A visual inspection of the dam, outlet spillway, and exit channel was made on 7 September 1978 by Corps of Engineers, St. Louis District personnel. The owner, Mr. Becker, accompanied the inspection team. Information provided by the owner relating to construction of the dam has been previously discussed in paragraph 1.2g. According to the owner, he knew of no stability or overtopping problems since the dam was built.

b. Project Geology: Field investigations indicated bedrock at the left abutment to be dolomite of the Ordovician Jefferson City formation.

c. Dam: Based on surface observations, the dam is composed of brown silty gravelly clay. Two seepage areas were observed which drain into a 3-foot pool at the toe of the dam before discharging into the downstream channel. One seepage area was observed at the intersection of the right abutment and earth embankment approximately 10-15 feet below the crown elevation of the dam. Another seepage area was located in the middle at the toe of the dam. Water from both seepage areas was clear running at the time of the inspection. The shallow pool at the toe of the dam was primarily formed by the flow from the seepage areas previously noted.

No detrimental settlement, cracking, or sinkholes were observed in or near the dam.

The downstream slope was covered with heavy vegetation with scattered trees 4 inches in diameter or less. The upstream slope has willow trees growing along the water edge with the crown being covered with grass. The roots systems of the trees constitute a potential seepage hazard.

Rodent burrows were observed on the right side of the upstream slope approximately 3-4 feet below the crown elevation. The burrow extended at least 4 feet into the dam embankment and subsidence above the burrows was also observed. The opening of the burrow was located below the water line of the lake.

No riprap exists on the upstream slope of the dam and no signs of erosion from wave action were noticed. There was no apparent gully erosion on the downstream face of the dam.

d. Appurtenant Structures: Appurtenant structures of the dam consisted of a spillway cut in a rock outcrop which discharges over a series of rock falls to reach the original channel. The spillway exit channel is not well defined and appeared to be an erosion

channel through the trees and heavy vegetative growth. Flow from the spillway is directed away and downstream of the dam.

e. Reservoir Area: No wave wash, excessive erosion or slides were observed along the shoreline.

f. Downstream Channel: The downstream channel is covered with heavy vegetation and debris which has accumulated from dead trees and leaves.

3.2 EVALUATION. None of the conditions observed are significant enough to indicate a need for immediate remedial action or a serious potential of failure. However, a well defined spillway outlet channel should be established and special attention should be given to the seepage areas noted in paragraph 3.1c above. Trees, brush, and rodent holes on the dam are all serious deficiencies which should be corrected.

Provision of graded riprap on the upstream face of the dam is considered good engineering practice; however, the small fetch (distance of lake over which a wave can develop), hilly terrain surrounding the lake, gentle upstream slope, and absence of existing wave erosion indicate the lack of riprap at this location is not of serious concern.

Erosion protection of the embankment adjacent to the spillway appears insufficient to resist sustained high flows.

Section 4 - Operational Procedures

4.1 PROCEDURES. Operational procedures are essentially nonexistent since the dam has an uncontrolled spillway and water passes freely over the spillway.

4.2 MAINTENANCE OF DAM. The dam has apparently received adequate maintenance until recently. The owner indicated that little if any maintenance had been performed for the past 1 to 2 years. This was evidenced by the brush and small trees growing on the embankment and the presence of animal burrows probably caused by muskrats. The owner indicated that muskrats had been a problem on at least one previous occasion.

4.3 MAINTENANCE OF OPERATING FACILITIES. No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT. No warning system is known to exist.

4.5 EVALUATION. Additional maintenance in the form of clearing and mowing the embankments, filling burrows, and establishing turf is recommended.

Section 5 - Hydraulic/Hydrologic

5.1 EVALUATION OF FEATURES.

a. Design Data: No design data were made available to the inspection team. All releases are non-regulated.

b. Experience Data: All of the pertinent data furnished in this report were derived from U.S. Geological Survey 7-1/2 minute quadrangle sheets or from measurements and surveys made during the inspection.

c. Visual Observations:

(1) Some seepage is apparent as discussed in paragraph 3.1c.

(2) Trees and brush are growing on the dam embankment.

(3) Some erosion has taken place in the guide levee along the spillway exit channel.

d. Overtopping Potential: The spillway cannot pass the Probable Maximum Flood (PMF) nor 1/2 the PMF without overtopping the dam. The PMF is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The spillway is capable of passing 25 percent of the PMF without overtopping. Routing 50 percent of the PMF through the two reservoirs indicates the dam will be overtopped by a flow of approximately 1600 cfs at a depth of about 8 inches for about 1/2 hour. The PMF would result in overtopping flow of approximately 3400 cfs, depth of about 1-1/2 feet for a duration of 3 hours.

The effect from rupture of the dam could extend approximately 2 miles downstream of the dam. There are three groups of farm buildings downstream of the dam which could be severely damaged and the lives of any inhabitants lost, should failure of the dam occur.

The results of this report are subject to change pending a more detailed study of the upper reservoir. Failure of the upper dam could result in overtopping of Becker Dam. The upstream dam is in the process of being modified to include a road over the top of the dam which will raise the dam 2 to 3 feet. A 30-inch concrete pipe is presently being planned for use as the spillway. However, this pipe size is subject to change. A preliminary analysis of the upstream dam was made in order to assess the hydrologic/hydraulic effects on Becker Dam. The computations are based on the conditions planned at this time, namely installation of the 30-inch culvert to replace the existing spillway.

Section 6 - Structural Stability

6.1 EVALUATION OF STRUCTURAL STABILITY.

a. Visual Observations: Visual observations of the dam and spillway are discussed and evaluated in Section 3 and 5. The dam has no other appurtenant structures.

b. Design and Construction Data: As discussed in Section 2, no significant design data are available. No stability analyses or seepage analyses have been performed which is considered a deficiency. Construction data is based on the personal recollections of the owner.

c. Operating Records: No operating records are available.

d. Post Construction Changes: According to the owner, no post-construction changes have occurred.

e. Seismic Stability: The dam is located in Seismic Zone 2, for which the inspection guidelines assign a "moderate" damage probability and design seismic coefficient of 0.05 g. Since neither original design analyses nor strengths of construction materials are available, an accurate seismic analysis cannot be made. The low dam height and clayey materials in the dam are factors minimizing the likelihood of failure due to an earthquake.

Section 7 - Assessment/Remedial Measures

7.1 DAM ASSESSMENT.

a. Safety: Several items are deficient which should be corrected. These items are: vegetative cover; animal burrows; insufficient erosion protection for the spillway and exit channel; insufficient spillway capacity; exit channel not well defined; and seepage at toe of dam and right abutment.

b. Adequacy of Information: No details are available regarding design of the dam. Data from the visual observations and verbal discussions are considered adequate to support the conclusions herein. Seepage and stability analyses are not on record as prescribed in the recommended guidelines which is considered a deficiency.

c. Urgency: It is recommended the remedial measures listed in Section 7.2 be accomplished in the near future. The item recommended in paragraph 7.2d below should be pursued on a high priority basis.

d. Necessity for Phase II: No Phase II inspection is recommended. The recommended remedial actions can be accomplished without further investigation.

7.2 REMEDIAL MEASURES.

The following remedial measures are recommended:

a. Remove trees and brush.

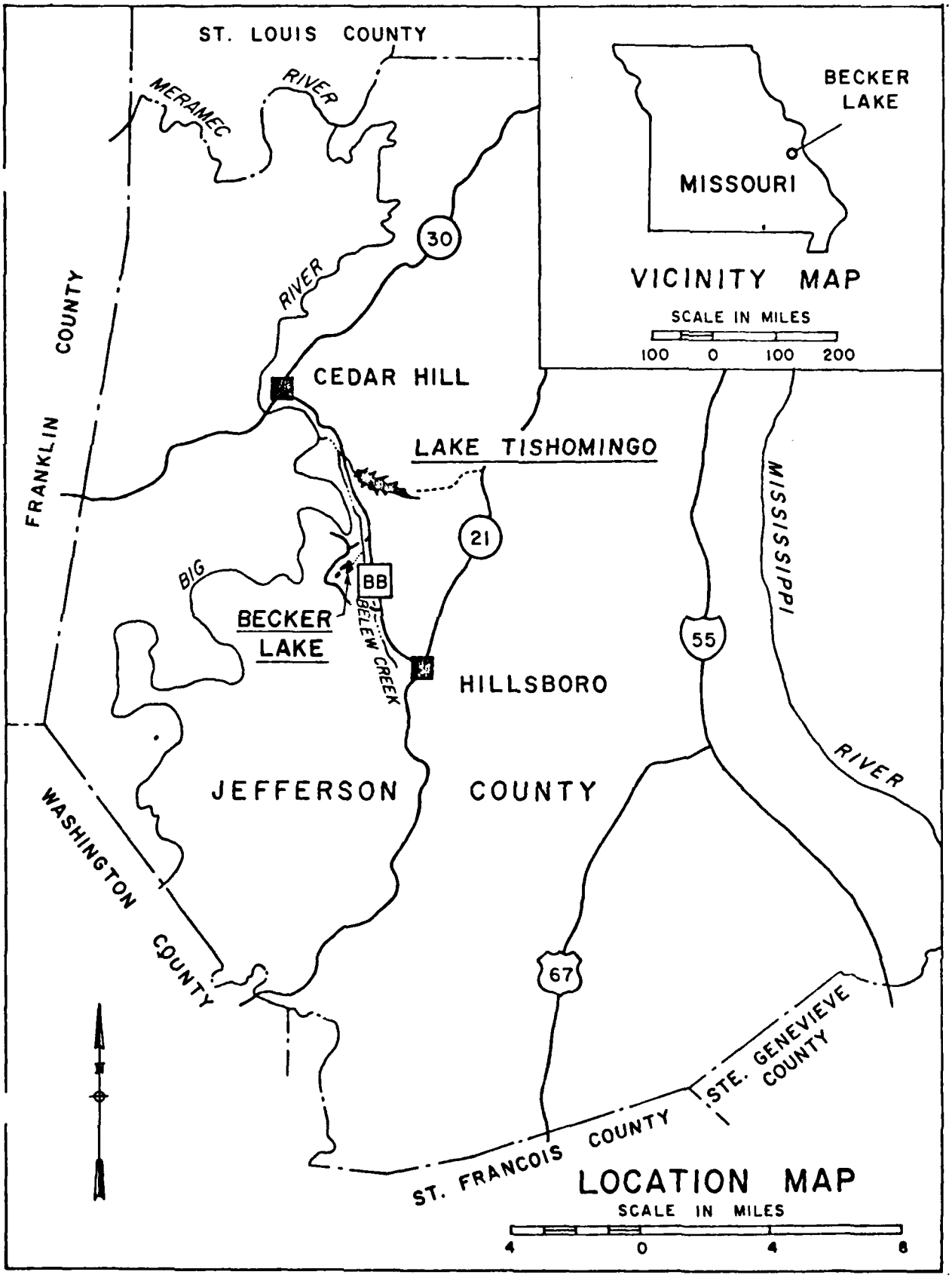
b. Fill animal burrows.

c. Establish and maintain a grass cover on the embankment.

d. Spillway size and/or height of dam should be increased to pass at least one-half PMF. In either case, the spillway should be protected to prevent erosion.

e. Stability and seepage analyses of the dam should be performed by a professional engineer experienced in the design and construction of dams. Special attention should be given to the areas at the right abutment and at the toe of the dam where seepage was observed. These analyses should provide a design of seepage control works and other remedial measures related to embankment stability and erosion protection which may be found necessary as a result of these analyses.

f. A detailed inspection of the dam and spillway should be made every 2 to 5 years by a professional engineer experienced in the design and construction of dams.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HILLSBORO
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WASHINGTON COUNTY
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MISSISSIPPI
RIVER
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STE. GENEVIEVE COUNTY
ST. FRANCOIS COUNTY
LOCATION MAP
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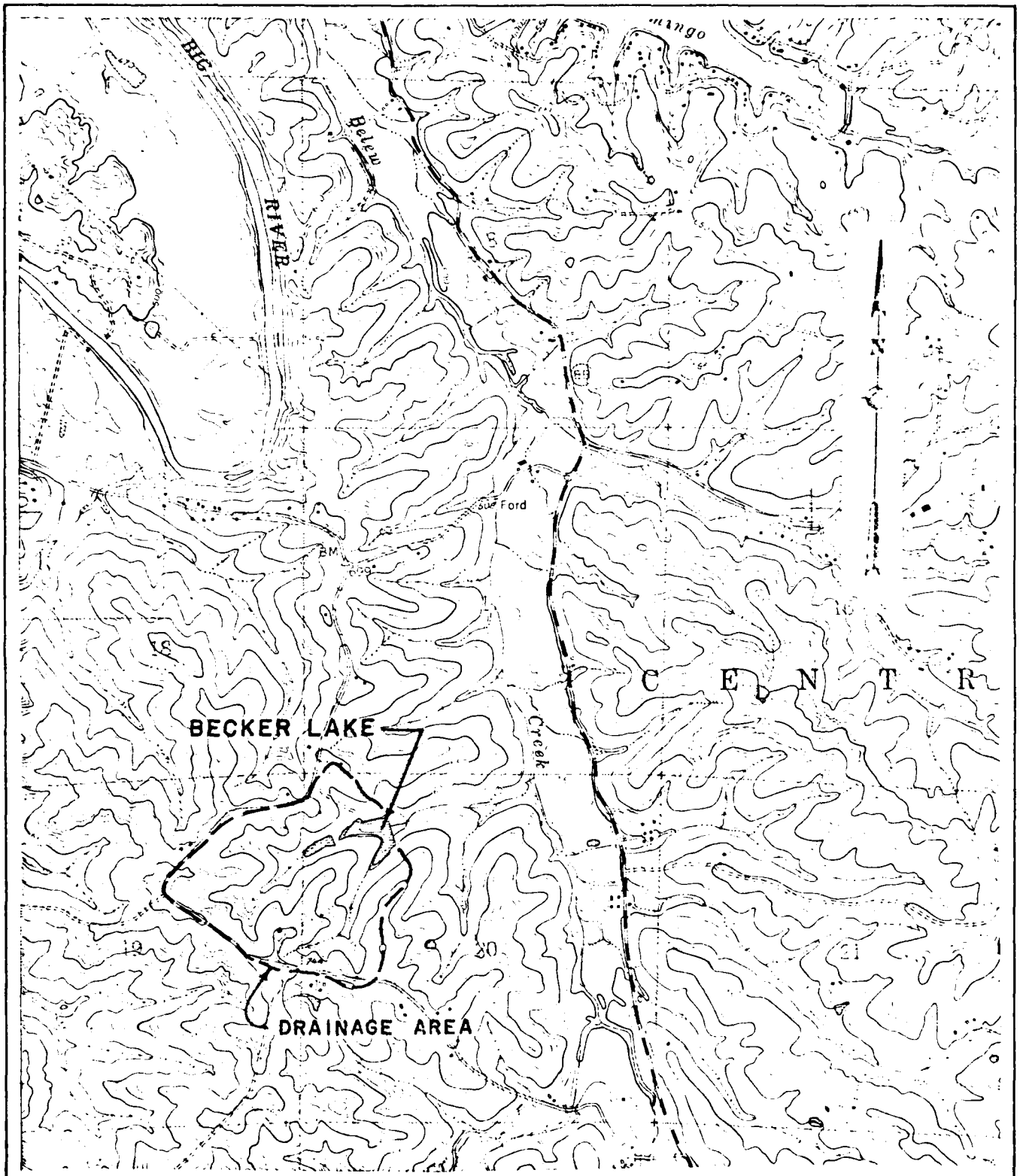
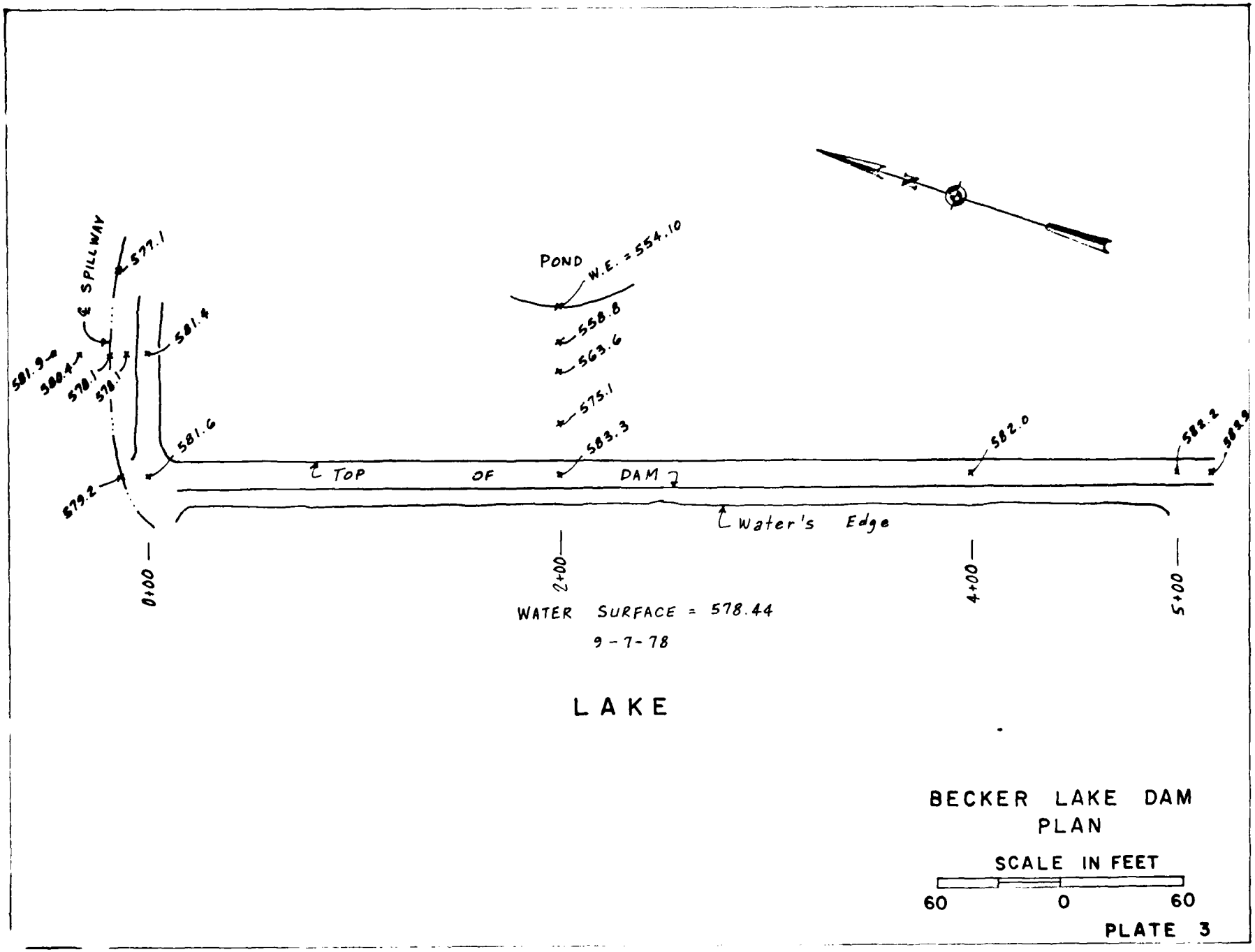
PLATE 1



BECKER LAKE

VICINITY TOPOGRAPHY

PLATE 2



BECKER LAKE DAM
PLAN

SCALE IN FEET

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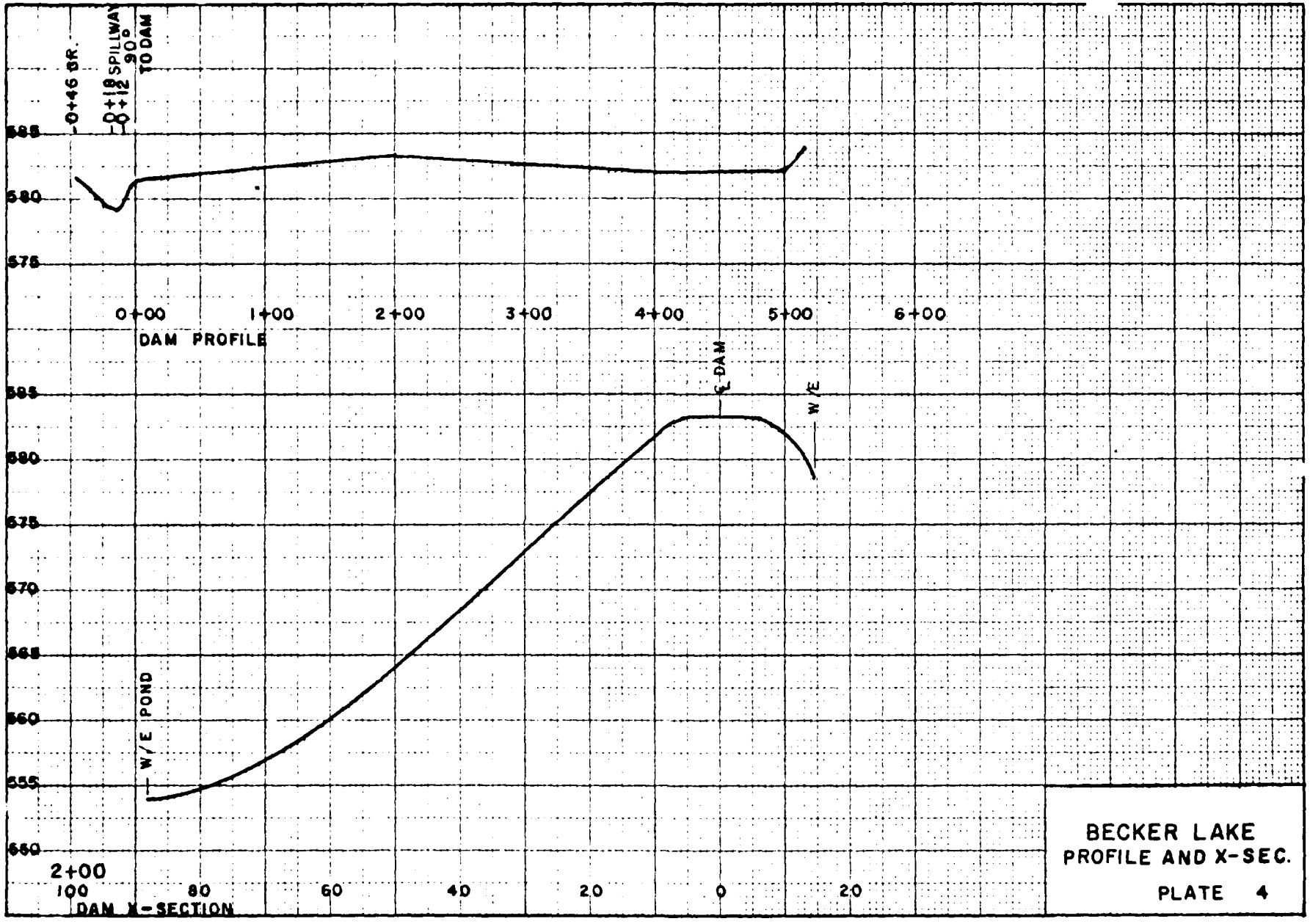
PLATE 3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DAM X-SECTION
BECKER LAKE
PROFILE AND X-SEC.
PLATE 4

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." Reduction factors have not been applied. A 24-hour storm duration is assumed with total depth distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use, and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-storage capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above analysis has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed in the computer printout. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. The upper dam was analyzed following the method outlined above. Conditions were assumed as stated in Section 5 of this report; namely, a 30-inch culvert spillway, and corresponding dam height of 24 feet $\pm$. This upper dam is estimated to pass a flood of about 20 percent of the PMF without overtopping.

PROJECT		COMPUTED BY	DATE
Dam Safety Analysis	Page — of —		
SUBJECT		CHECKED BY	DATE
Becket Dam 30435			

Background Data

Tandem Dams. Lower Dam Built 1964, Upper Dam Built 1908
Spillway for Upper Dam is presently being converted from notch in rock outcropping to 1 (2) 30 in RCP.
Spillway for Lower Dam is notch in rock outcropping on left side of Dam. Exit channel is cut in rock inland a parallel guide levee. There is some erosion of the guide levee.
Some evidence of seepage in center of U.S. Dam.
The D.A. is steep hills forested, some underbrush, housing development being planned along lake.

Basic Data

D.A. (U) = 88 acres = .14 sq mi
D.A (L) = 86 acres below = .13 sq mi 174 acres total = .27 sq mi

Antecedent condition III
Soil Type C
SCS curve no. 88

TC = .17 hrs Lag = .10 → Upper Dam
TC = .15 hrs Lag = .09 → Lower Dam

```
 1              A1       PECKER LAKE DAM  JEFFERSON COUNTY, MO
 2              A2       DAM SAFETY ANALYSIS   INVENTORY NO 30435
 3              A3       LYNNE PUETZ  SEPT 1978
 4              B    288        0        5        0        0        0        0        0       -5        0
 5              B1     5
 6              J      1        4        1
 7              J1   .25      .30      .50      1.0
 8              K      0        0                                    1
 9              K1 **** INFLOW HYDROGRAPH FOR UPPER RESERVOIR ****
10              M      1        2      .14                    1.0                                      1
11              P      0       25      102      120      130
12              T                                                          -1      -87
13              W2              .10
14              X    -.5     -.02      1.5
15              K      1        1                                    1
16              K1 **** ROUTE THROUGH UPPER RESERVOIR USING MODIFIED PULS ****
17              Y                                 1        1
18              Y1     1                                                -597.3       -1
19              Y4 597.3      600    602.8      605      610      620
20              Y5     0       24       54       70       93      115
21              $S     0        5       14       29       37       62      132
22              $E   578      590    597.3    602.8      605      610      620
23              $$ 597.3
24              $D 602.8      3.0      1.5      190
25              K      0        2                                    1
26              K1 **** INFLOW HYDROGRAPH FOR LOWER RESERVOIR ****
27              M      1        2      .13                    1.0                                      1
28              P      0       25      102      120      130
29              T                                                          -1      -89
30              W2              .09
31              X    -.5     -.02      1.5
32              K      2        2                                    0       1
33              K1 ****COMBINE HYDROGRAPHS ****
34              H      1    30435                          2                1
35              K1 **** ROUTE THROUGH LOWER RESERVOIR USING MODIFIED PULS ****
36              Y                                 1        1
37              Y1     1                                                -579.2       -1
38              Y4 579.2      580      581      582      583      584    584.7    585.4
39              Y5     0      100      290      550      950     1200     1600     2000
40              $S     0       80      100      130      175      250      315      475
41              $E   559    579.2    582.0      585      590      595      600      610
42              $$ 579.2
43              $D 582.0      3.0      1.5      500
44              E     99

1                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                 PUNCH HYDROGRAPH AT            0
                                 ROUTE HYDROGRAPH TO            1
                                 RUNOFF HYDROGRAPH AT           2
                                 COMBINE 2 HYDROGRAPHS AT       3
                                 ROUTE HYDROGRAPH TO        30435
                                 END OF NETWORK
```

PLAN FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .25	RATIO 2 .30	RATIO 3 .50	RATIO 4 1.00
HYDROGRAPH AT	0	.14	1	488.	586.	976.	1952.
	(	.36)	(	13.82)(	16.58)(	27.63)(	55.27)(
ROUTED TO	1	.14	1	418.	524.	910.	1891.
	(	.36)	(	11.84)(	14.83)(	25.76)(	53.54)(
HYDROGRAPH AT	2	.13	1	453.	544.	906.	1813.
	(	.34)	(	12.83)(	15.40)(	25.67)(	51.33)(
2 COMBINED	2	.27	1	871.	1067.	1816.	3703.
	(	.70)	(	24.67)(	30.23)(	51.43)(	104.87)(
ROUTED TO	30435	.27	1	469.	673.	1595.	3363.
	(	.70)	(	13.28)(	19.05)(	45.15)(	95.24)(

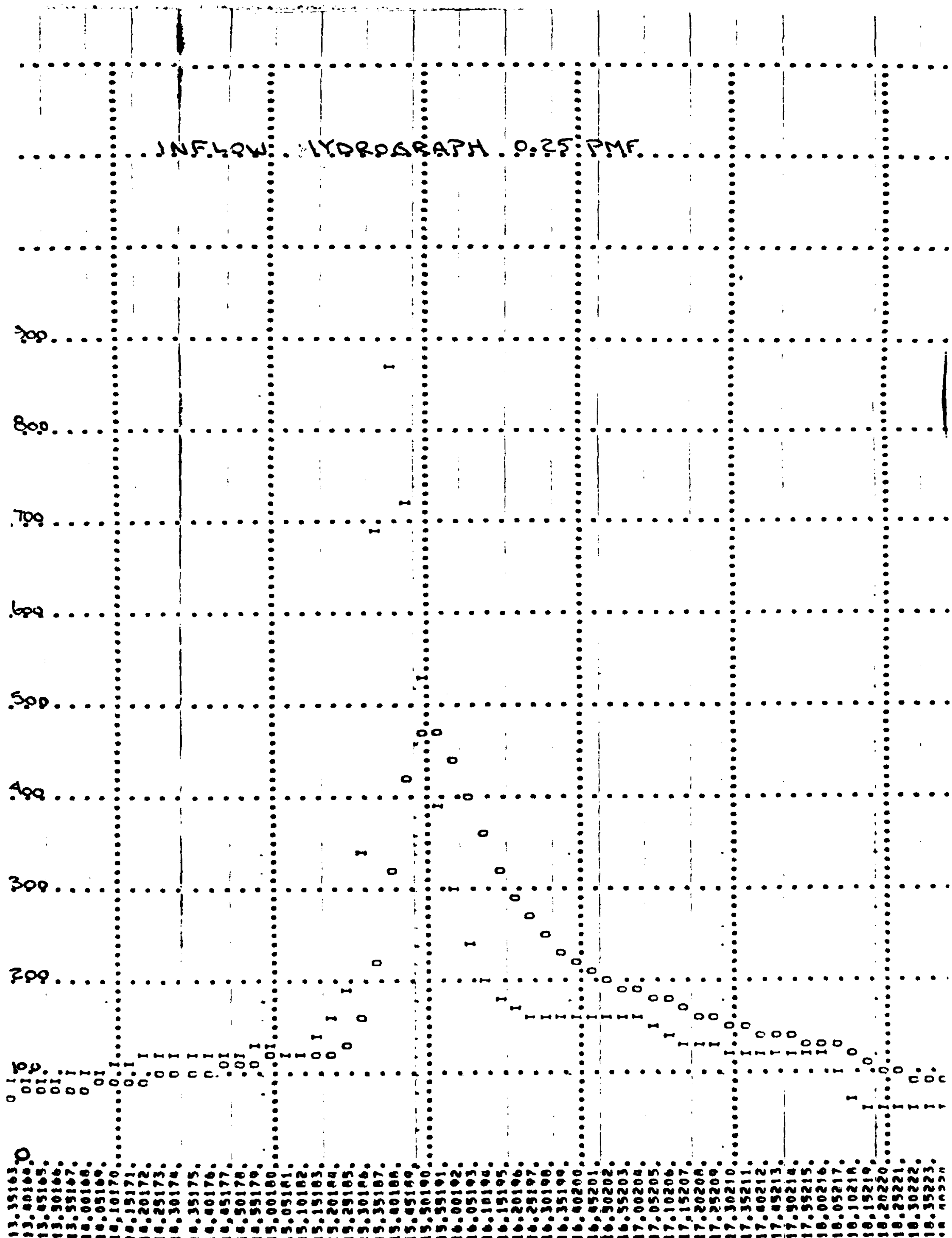
1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	579.20	579.20	582.00
STORAGE	80.	80.	100.
OUTFLOW	0.	0.	550.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.25	581.69	0.00	98.	469.	0.00	15.83	0.00
.30	582.13	.13	101.	673.	.25	15.83	0.00
.50	582.65	.65	106.	1595.	.58	15.75	0.00
1.00	583.34	1.34	113.	3363.	3.08	15.67	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 20 AUG 78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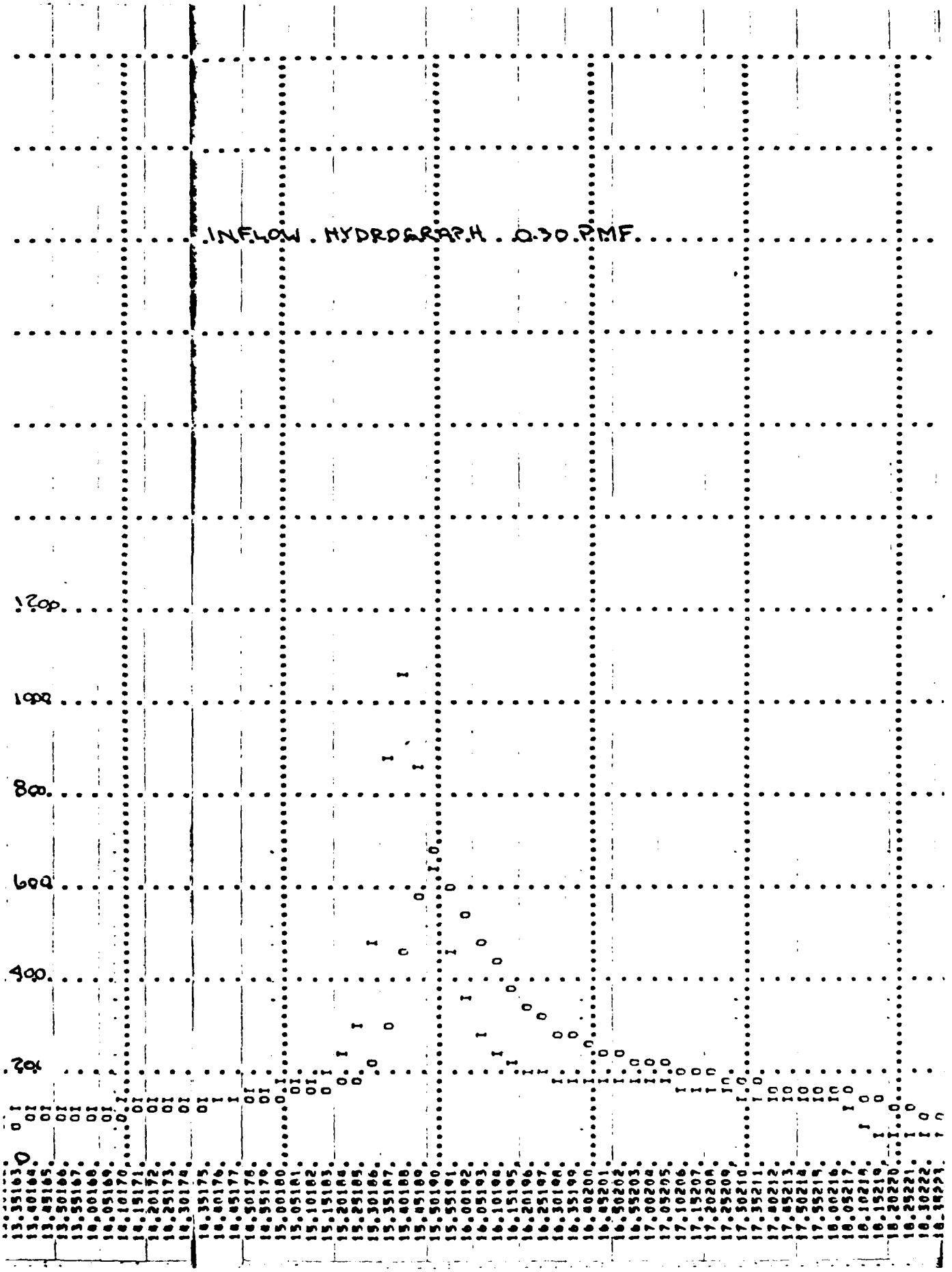
800
700
600
500
400
300
200
100
0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1200.
1000
800.
600
400.
200
0.

INFLOW HYDROGRAPH 0.50 PME

2000.

1600.

1200.

800

400

0
13.40166 IO
13.45165 IO
13.50166 O I
13.55167 I
14.00168 O I
14.05169 I
14.10170 O I
14.15171 O I
14.20172 I
14.25173 I
14.30174 I
14.35175 I
14.40176 I
14.45177 I
14.50178 I
14.55179 I
15.00180 I
15.05181 I
15.10182 I
15.15183 I
15.20184 I
15.25185 I
15.30186 I
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15.45189 I
15.50190 I
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16.45201 I
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16.55203 I
17.00204 I
17.05205 I
17.10206 I
17.15207 I
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17.35211 I
17.40212 I
17.45213 I
17.50214 I
17.55215 I
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18.40224 I

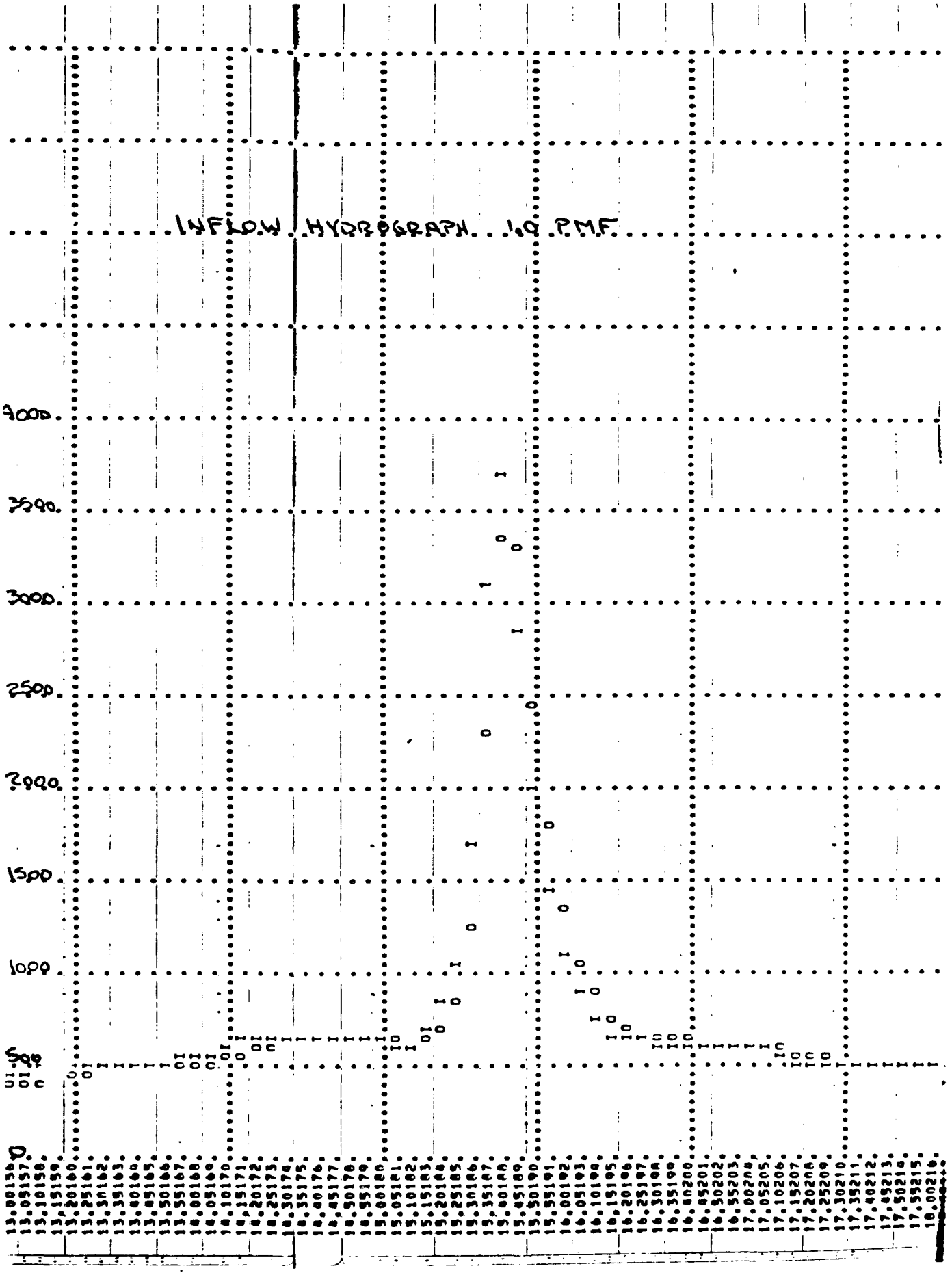
INFLOW HYDROGRAPH 1.0 P.M.F.
4000.
3500.
3000.
2500.
2000.
1500.
1000.
500.
0.

PHOTO 1 View of Downstream Slope From Left Abutment

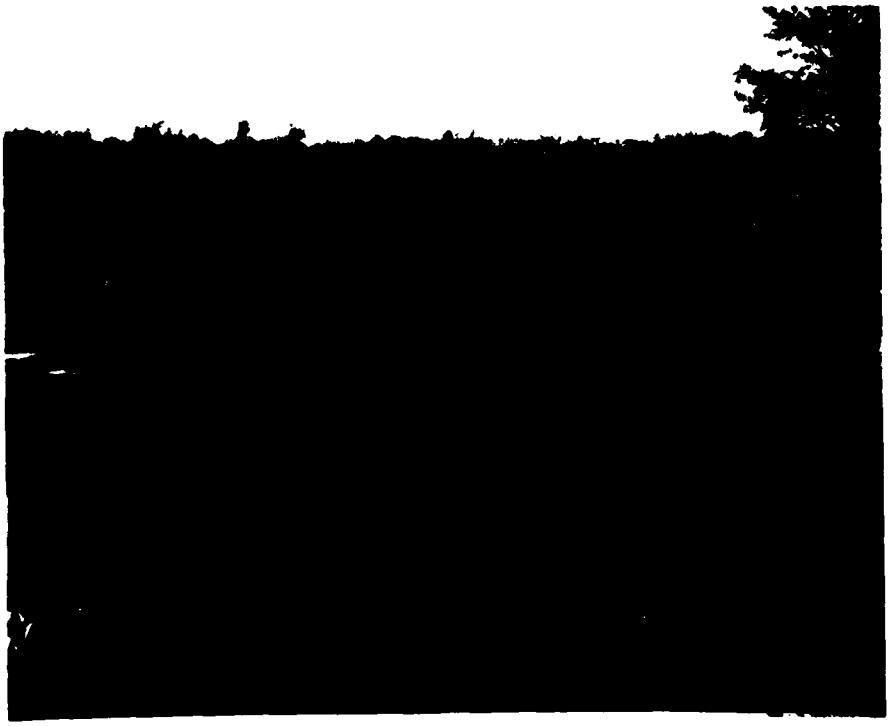

PHOTO 2 Pool at Downstream Toe of Dam and Location of Seepage Area Near Middle of Dam

PHOTO 3 Seepage Area at Right Abutment

PHOTO 4 Rodent Burrow on Upstream Slope

PHOTO 5 Spillway Looking Downstream With Natural Earth Berm on Right Side


DATE
ILME